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EXAMINER	
HANDAL, KAITY V	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 08/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/015,845	EDLUND, DAVID J.	
	Examiner	Art Unit	
	Kaity Handal	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-60* is/are pending in the application.

4a) Of the above claim(s) *14,15,46 and 47* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13,16-45 and 48-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 7/28/2003 6/18/2002 2/19/2002 1-16-2004
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Species a-1 (fig. 1), Species b-1 (fig. 4 and 9), Species c-5 (fig. 4), Species d-1 (fig. 9) and Species e-1 (fig. 11) with all claims (1-60) being generic to the selected species in the reply filed on 7/18/2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. Upon further review by the examiner, claims 14, and 46 are withdrawn from consideration, they are read on the non-elected Species b-2 (fig. 10), b-3 (fig. 14), b-4 (fig. 15), b-5 (fig. 16), b-6 (fig. 17), b-7 (fig. 18), and do not read on the elected Species a-1 (fig. 1), Species b-1 (fig. 4 and 9), Species c-5 (fig. 4), Species d-1 (fig. 9) and Species e-1 (fig. 11).

3. Claims 15 and 47 are withdrawn as they depend on the withdrawn claims 14 and 46 respectively as described above.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-12, 24-28 and 60 are rejected under 35 U.S.C. 102(b) as being anticipated by Okada et al. (U.S. Pat. 5,685,890).

With respect to claims 1 and 12, Okada teaches a fuel processing system (fig. 3), comprising: a sulfur-removal assembly including at least one sulfur-absorbent bed adapted to receive a stream containing a carbon-containing feedstock and sulfur compounds, wherein the bed contains a sulfur-absorbent material that is adapted to reduce the concentration of the sulfur compounds in the stream, and further wherein the sulfur-absorbent material is adapted to catalyze the conversion of carbon monoxide and water to yield hydrogen gas and carbon dioxide at temperatures less than approximately 350°C (col. 5, lines 1-5); and a fuel processor adapted to receive a feed stream that includes the carbon-containing feedstock from the sulfur-removal assembly and to produce a product hydrogen stream containing hydrogen gas therefrom (col. 4, lines 32-40).

With respect to claim 5, Okada teaches a fuel processing system wherein the sulfur-absorbent material is adapted to absorb organic sulfur compounds (col. 3, lines 50-58).

With respect to claims 8 and 9, Okada teaches a fuel processing system wherein the sulfur absorbent material includes 45% copper oxide (col. 8, line 49).

Regarding limitations recited in claims 2-4, 6, and 7 which are directed to specific properties of the sulfur absorbent material, the examiner notes once a specific absorbent composition is disclosed by the reference which is copper oxide, as set forth above, and as described in the instant application specification section (page

10, lines 17-21 and page 11, lines 1-21), the disclosed absorbent will, inherently, display recited properties.

With respect to claim 10, Okada teaches a fuel processing system wherein the sulfur-absorbent material further includes zinc oxide (col. 3, lines 50-53 and col. 8, line 49).

With respect to claim 11, Okada teaches a fuel processing system wherein the sulfur-absorbent material includes chromium (col. 3, lines 27-28).

With respect to claim 24, Okada teaches a fuel processing system wherein the sulfur-removal assembly further includes at least one sulfur-removal region adapted to remove sulfur compounds from the carbon-containing feedstock other than with the sulfur absorbent material (fig. 3) (col. 5, lines 14-22).

With respect to claim 25, Okada teaches a fuel processing system wherein at least one sulfur-removal region is adapted to remove sulfur compounds by hydrodesulfurization (col. 5, lines 14-22).

With respect to claim 26, Okada teaches a fuel processing system wherein the carbon-containing feedstock includes at least one hydrocarbon (col. 4, line 19).

Regarding limitations recited in claim 27 which is directed to material worked on, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP § 2114 and 2115. Further, process limitations do not have patentable weight in an apparatus claim. See Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to

contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim."

With respect to claim 28, Okada teaches a fuel processing system wherein the feed stream includes water and the fuel processor includes a reforming region with at least one reforming catalyst bed adapted to produce a stream containing hydrogen gas from the feed steam via a reforming reaction and further wherein the product hydrogen stream is formed from the stream containing hydrogen gas (col. 4, lines 32-40).

With respect to claim 60, Okada teaches a fuel processing system (fig. 3) wherein a steam reformer that is adapted to receive a feed steam comprising water and a carbon-containing feedstock and which includes a reforming region having at least one reforming catalyst bed in which a stream containing hydrogen gas is produced from the feed stream (col. 4, lines 32-41). Okada further teaches a sulfur-removal assembly comprising at least one sulfur absorbent bed upstream from the reforming region and adapted to absorb sulfur-containing compounds from at least a portion of the feed stream prior to delivery to the reforming region (col. 2, lines 61-66).

Okada further discloses that said desulfurizer absorbent material is made of copper oxide, zinc oxide, and aluminum oxide (col. 8, lines 47-49), these oxides are also low temperature shift catalysts as evidence by Towler et al. (U.S. Pat. No. 6,548,029 B1) (col. 4, lines 51-53). Therefor, the absorbent material disclosed by Okada also contains material that is low temperature shift catalyst.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al. (U.S. Pat. No. 5,685,890) as applied to claim 12 above, and further in view of Fanciullo (U.S. Pat. 4,098,959).

With respect to claim 13, Okada discloses all claim limitations as set forth above as well as the sulfur absorbent bed being operated at a temperature of 350°C but fails to show a means such as a heating assembly adapted to heat the bed.

Fanciullo teaches wherein the fuel processing system (45) which includes a heating assembly (40) adapted to heat a desulfurizer (20) (col. 4, lines 10-14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the heating assembly of Fanciullo to heat the sulfur-absorbent bed in Okada's reformer, in order to heat said sulfur-absorbent bed to Okada's required temperature.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 16-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al. (U.S. Pat. No. 5,685,890) as applied to claim 1 above, and further in view of Edlund et al. (U.S. Pat. No. 6,451,464 B1).

With respect to claim 16, Okada discloses all claim limitations as set forth above. He teaches a fuel processing system wherein each of the sulfur-absorbent beds/separation region contains said sulfur-absorbent material having a capacity of absorbed sulfur. Okada fails to show wherein the fuel processing system includes at least one sensor adapted to measure the percentage of the capacity at which each of the beds is operating. Edlund teaches a fuel processing system wherein each of the absorbent beds (30) has a capacity of absorbed impurities (col. 2, lines 41-48 and 60-65) and further wherein the fuel processing system includes at least one sensor (52) in order to detect the concentration of a specific component (col. 4, lines 13-24).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include at least one sensor adapted to measure the percentage of the capacity of absorbed impurities in the desulfurizer beds of Okada's reformer, as taught by Edlund, in order to detect the concentration of a specific component.

With respect to claim 17, Okada discloses all claim limitations as set forth above. Okada teaches a fuel processing system wherein each of the sulfur-absorbent beds

containing the sulfur-absorbent material has a capacity of absorbed sulfur. Okada fails to show wherein the fuel processing system further includes a controller that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has been reached and to trigger a user-notifying event responsive thereto. Edlund teaches wherein the fuel processing system further includes a controller (54) that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has been reached and to trigger a user-notifying event responsive thereto in order to alert users that there has been a failure (col. 4, lines 31-42) and (col. 6, lines 53-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has been reached and to trigger a user-notifying event responsive thereto in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

With respect to claim 18, Okada discloses all claim limitations as set forth above. Okada fails to show a fuel processing system wherein upon determination that a bed is operating above the threshold value, the controller is adapted to send a control signal to a user-notifying device. Edlund teaches wherein said controller (54) is adapted to send a control signal to a user-notifying device in order to alert users that there has been a failure (col. 4, lines 36-42) and (col. 6, lines 53-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller adapted to send a control signal to a user-

notifying device in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

With respect to claim 19, Okada discloses all claim limitations as set forth above. Okada fails to show a fuel processing system wherein the controller includes at least one sensor adapted to measure the percentage of each bed's capacity at which the beds are operating. Edlund teaches a fuel processing system wherein the controller (54) includes at least one sensor (52) adapted to measure the percentage of each bed's capacity at which the beds are operating in order to detect the concentration of a specific component (col. 4, lines 13-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller which includes at least one sensor adapted to measure the percentage of each bed's capacity at which the beds are operating in Okada's reformer, as taught by Edlund, in order to detect the concentration of a specific component.

With respect to claim 20, Okada discloses all claim limitations as set forth above. Okada fails to show a fuel processing system wherein each of the said sulfur-absorbent beds containing the sulfur-absorbent material includes a sensor in communication with the controller and adapted to measure the percentage of the bed's capacity of absorbed sulfur at which the bed is operating. Edlund teaches a fuel processing system wherein each of the absorbent beds includes a sensor (52) in communication with the controller (54) and adapted to measure the percentage of the

bed's capacity of absorbed impurities at which the bed is operating in order to detect the concentration of a specific component (col. 4, lines 13-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller adapted to measure the percentage of the bed's capacity of absorbed impurities at which the bed is operating in Okada's reformer, as taught by Edlund, in order to detect the concentration of a specific component.

With respect to claim 21, Okada discloses all claim limitations as set forth above. Okada fails to show wherein said controller includes a memory portion in which at least one threshold value is stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material. Edlund teaches a fuel processing system wherein the controller includes a memory portion (fig. 2, 56) in which at least one threshold value is stored for each of the absorbent beds containing the impurities absorbent material in order to provide continuous monitoring of the product stream (col. 4, lines 31-33 and col. 6, lines 16-23).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller which includes a memory portion in which at least one threshold value is stored for each of the absorbent beds containing the impurities absorbent material in Okada's reformer, as taught by Edlund, in order to provide continuous monitoring of the product stream.

With respect to claims 22, Okada discloses all claim limitations as set forth above. Okada fails to show wherein said controller includes a memory portion in

which at least a lower and a higher threshold values are stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material, and wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device. Edlund teaches a fuel processing system wherein the controller includes a memory portion (fig. 2, 56) in which at least a lower and a higher threshold values are stored for each of the absorbent beds containing the impurities absorbent material, and wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device in order to alert users that there has been a failure (col. 4, lines 31-33 and lines 36-46) and (col. 6, lines 52-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller which includes a memory portion in which at least a lower and a higher threshold values are stored for each of the absorbent

beds containing the impurities absorbent material, and wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

With respect to claim 23, Okada discloses all claim limitations as set forth above. Okada fails to show wherein the user-notifying device is adapted to produce different responses responsive to receiving the first and the second control signals. Edlund teaches a fuel processing system (fig. 2) wherein the user-notifying device is adapted to produce different responses responsive to receiving the first and the second control signals in order to alert users that there has been a failure (col. 6, lines 53-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include user-notifying device is adapted to produce different responses responsive to receiving the first and the second control signals in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 29-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al. (U.S. Pat. 5,685,890), as applied to claims 1 and 28 above, and further in view of Edlund (U.S. Pat. 5,861,137).

With respect to claim 29, Okada discloses all claim limitations as set forth above, Okada further teaches wherein the stream containing hydrogen gas further includes other gases (col. 4, lines 38-40), but he fails to disclose wherein the fuel processor includes a separation region in which the stream containing hydrogen gas is separated into a hydrogen-rich stream containing at least substantially hydrogen gas and a byproduct stream containing at least a substantial portion of the other gases. Edlund teaches fuel processing wherein the fuel processor includes a separation region in which the stream containing hydrogen gas is separated in order to separate the hydrogen stream from the byproduct stream (col. 3, lines 30-34).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a separation region in which the stream containing hydrogen gas is separated into a hydrogen-rich stream containing at least substantially hydrogen gas in Okada's reformer, as taught by Edlund, in order to separate the hydrogen stream from the byproduct stream.

With respect to claim 30, Edlund further teaches fuel processing wherein said separation region is adapted to separate the stream containing hydrogen gas into the hydrogen-rich stream and the byproduct stream via a pressure-driven separation process in order for the hydrogen stream to migrate through membrane tubes (fig. 3, 54) (col. 4, line 67, and col. 5, lines 1-2).

With respect to claim 31, Edlund further teaches wherein the separation region includes at least one hydrogen-permeable membrane (fig. 3, 54) positioned to be contacted by the stream containing hydrogen in order to separate the hydrogen stream from the byproduct stream (col. 3, lines 31-34).

With respect to claims 32 and 35, Okada discloses all claim limitations as set forth above but fails to disclose wherein the fuel processing system further comprises a fuel cell stack (fig. 1, 16) adapted to receive at least a portion of the product hydrogen stream and to produce an electric current therefrom. Edlund teaches a reformer comprising a fuel cell stack adapted to receive at least a portion of the product hydrogen stream in order to generate electrical energy (col. 6, lines 35-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a fuel cell stack adapted to receive at least a portion of the product hydrogen stream in Okada's reformer, as taught by Edlund, in order to generate electrical energy.

With respect to claim 33, Edlund further teaches wherein at least one membrane comprises at least one of palladium and a palladium alloy in order to fabricate said membrane utilizing preferred materials in the art (col. 4, lines 58-63).

With respect to claim 34, Edlund further teaches a plurality of hydrogen-permeable membranes in order to increase hydrogen output of the reformer (fig. 4, 54) (col. 6, lines 46-56).

12. Claims 36-44 and 56-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al. (U.S. Pat. 5,685,890), and further in view of Edlund (U.S. Pat. 5,861,137).

With respect to claim 36 and 44, Okada teaches a fuel processing system (fig. 3), comprising: a sulfur-removal assembly including at least one sulfur-absorbent bed adapted to receive a stream containing a carbon-containing feedstock and sulfur compounds, wherein the bed contains a sulfur-absorbent material that is adapted to reduce the concentration of the sulfur compounds in the stream (col. 5, lines 1-5), and further wherein the sulfur-absorbent material is selected from a group that does not catalyze the formation of methane or coke from the carbon-containing feedstock when the bed is operated at a temperature of less than approximately 400°C, and further wherein the sulfur-absorbent material is adapted to absorb organic sulfur compounds. Okada further teaches a fuel processor adapted to receive a feed stream that includes the carbon-containing feedstock from the sulfur-removal assembly and to produce a product hydrogen stream containing hydrogen gas therefrom (col. 4, lines 32-40), wherein the fuel processor includes a reforming

region (illustrated in fig. 3) containing at least one reforming catalyst bed in which a mixed gas stream containing hydrogen gas and other gases is produced from a feed stream that includes the stream containing the carbon-containing feedstock and water (col. 4, lines 32-40). Okada fails to teach wherein the fuel processor includes a separation region in which the mixed gas stream is separated via a pressure-driven separation process into a hydrogen-rich stream containing at least substantially hydrogen gas and a byproduct stream containing at least a substantial portion of the other gases.

Edlund teaches a reformer which includes a separation region in which the mixed gas stream is separated via a pressure-driven separation process into a hydrogen-rich stream containing at least substantially hydrogen gas and a byproduct stream containing at least a substantial portion of the other gases in order to separate the hydrogen stream from the byproduct stream (col. 3, lines 30-34) and (col. 4, line 67, and col. 5, lines 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a pressure-driven separation process in which the stream containing hydrogen gas is separated into a hydrogen-rich stream containing at least substantially hydrogen gas in Okada's reformer, as taught by Edlund, in order to separate the hydrogen stream from the byproduct stream.

Regarding limitations recited in claims 36-39 which are directed to specific properties of the sulfur absorbent material, the examiner notes once a specific absorbent composition is disclosed by the reference which is copper oxide, as set

forth above, and as described in the instant application specification section (page 10, lines 17-21 and page 11, lines 1-21), the disclosed absorbent will, inherently, display recited properties.

With respect to claims 40 and 41, Okada teaches a fuel processing system wherein the sulfur absorbent material includes 45% copper oxide (col. 8, line 49). Material composition does not limit an apparatus claim, further more, the percentage of copper oxide of 45% falls within the ranges of 10-90% and 20-60% as claimed, therefore claim requirement is met.

With respect to claim 42, Okada teaches a fuel processing system wherein the sulfur-absorbent material further includes zinc oxide (col. 3, lines 50-53 and col. 8, line 49).

With respect to claim 43, Okada teaches a fuel processing system wherein the sulfur-absorbent material includes chromium (col. 3, lines 27-28).

With respect to claim 56, Edlund further teaches fuel processing wherein the separation region includes at least one hydrogen-permeable membrane (fig. 3, 54) positioned to be contacted by the stream containing hydrogen in order to separate the hydrogen stream from the byproduct stream (col. 3, lines 31-34).

With respect to claim 57, Edlund further teaches wherein at least one membrane comprises at least one of palladium and a palladium alloy in order to fabricate said membrane utilizing preferred materials in the art (col. 4, lines 58-63).

With respect to claim 58, Edlund further teaches a plurality of hydrogen-permeable membranes in order to increase hydrogen output of the reformer (fig. 4, 54) (col. 6, lines 46-56).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a plurality of hydrogen-permeable membranes in Okada's reformer, as taught by Edlund, in order to increase hydrogen output of the reformer.

With respect to claim 59, Okada discloses all claim limitations as set forth above but fails to disclose wherein the fuel processing system further comprises a fuel cell stack (fig. 1, 16) adapted to receive at least a portion of the product hydrogen stream and to produce an electric current therefrom. Edlund teaches a reformer comprising a fuel cell stack adapted to receive at least a portion of the product hydrogen stream in order to generate electrical energy (col. 6, lines 35-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a fuel cell stack adapted to receive at least a portion of the product hydrogen stream in Okada's reformer, as taught by Edlund, in order to generate electrical energy.

13. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al. (U.S. Pat. No. 5,685,890) and Edlund (U.S. Pat. 5,861,137) as applied to claim 44 above, and further in view of Fanciullo (U.S. Pat. 4,098,959).

With respect to claim 45, Okada discloses all claim limitations as set forth above as well as the sulfur absorbent bed being operated at a temperature of 350°C but fails to show a means such as a heating assembly adapted to heat the bed.

Fanciullo teaches wherein the fuel processing system (45) which includes a heating assembly (40) adapted to heat a desulfurizer (20) (col. 4, lines 10-14).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include the heating assembly of Fanciullo to heat the sulfur-absorbent bed in Okada's reformer, in order to heat said sulfur-absorbent bed to Okada's required temperature.

14. Claims 48-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al. (U.S. Pat. No. 5,685,890) and Edlund (U.S. Pat. 5,861,137) as applied to claim 44 above, and further in view of Edlund et al. (U.S. Pat. No. 6,451,464 B1).

With respect to claim 48, Okada discloses all claim limitations as set forth above. He teaches a fuel processing system wherein each of the sulfur-absorbent beds/separation region contains said sulfur-absorbent material having a capacity of absorbed sulfur. Okada fails to show wherein the fuel processing system includes at least one sensor adapted to measure the percentage of the capacity at which each of the beds is operating. Edlund teaches a fuel processing system wherein each of the absorbent beds (30) has a capacity of absorbed impurities (col. 2, lines 41-48 and 60-65) and further wherein the fuel processing system includes at least one

sensor (52) in order to detect the concentration of a specific component (col. 4, lines 13-24).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include at least one sensor adapted to measure the percentage of the capacity of absorbed impurities in the desulfurizer beds of Okada's reformer, as taught by Edlund, in order to detect the concentration of a specific component.

With respect to claim 49, Okada discloses all claim limitations as set forth above. Okada teaches a fuel processing system wherein each of the sulfur-absorbent beds containing the sulfur-absorbent material has a capacity of absorbed sulfur. Okada fails to show wherein the fuel processing system further includes a controller that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has been reached and to trigger a user-notifying event responsive thereto. Edlund teaches wherein the fuel processing system further includes a controller (54) that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has been reached and to trigger a user-notifying event responsive thereto in order to alert users that there has been a failure (col. 4, lines 31-42) and (col. 6, lines 53-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller that is adapted to determine when a threshold value corresponding to a predetermined percentage of the capacity has

been reached and to trigger a user-notifying event responsive thereto in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

With respect to claim 50, Okada discloses all claim limitations as set forth above. Okada fails to show a fuel processing system wherein upon determination that a bed is operating above the threshold value, the controller is adapted to send a control signal to a user-notifying device. Edlund teaches wherein said controller (54) is adapted to send a control signal to a user-notifying device in order to alert users that there has been a failure (col. 4, lines 36-42) and (col. 6, lines 53-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller adapted to send a control signal to a user-notifying device in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

With respect to claim 51, Okada discloses all claim limitations as set forth above. Okada fails to show a fuel processing system wherein the controller includes at least one sensor adapted to measure the percentage of each bed's capacity at which the beds are operating. Edlund teaches a fuel processing system wherein the controller (54) includes at least one sensor (52) adapted to measure the percentage of each bed's capacity at which the beds are operating in order to detect the concentration of a specific component (col. 4, lines 13-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller which includes at least one sensor adapted to measure the percentage of each bed's capacity at which the beds are

operating in Okada's reformer, as taught by Edlund, in order to detect the concentration of a specific component.

With respect to claim 52, Okada discloses all claim limitations as set forth above. Okada fails to show a fuel processing system wherein each of the said sulfur-absorbent beds containing the sulfur-absorbent material includes a sensor in communication with the controller and adapted to measure the percentage of the bed's capacity of absorbed sulfur at which the bed is operating. Edlund teaches a fuel processing system wherein each of the absorbent beds includes a sensor (52) in communication with the controller (54) and adapted to measure the percentage of the bed's capacity of absorbed impurities at which the bed is operating in order to detect the concentration of a specific component (col. 4, lines 13-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller adapted to measure the percentage of the bed's capacity of absorbed impurities at which the bed is operating in Okada's reformer, as taught by Edlund, in order to detect the concentration of a specific component.

With respect to claim 53, Okada discloses all claim limitations as set forth above. Okada fails to show wherein said controller includes a memory portion in which at least one threshold value is stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material. Edlund teaches a fuel processing system wherein the controller includes a memory portion (fig. 2, 56) in which at least one threshold value is stored for each of the absorbent beds containing the impurities absorbent material

in order to provide continuous monitoring of the product stream (col. 4, lines 31-33 and col. 6, lines 16-23).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller which includes a memory portion in which at least one threshold value is stored for each of the absorbent beds containing the impurities absorbent material in Okada's reformer, as taught by Edlund, in order to provide continuous monitoring of the product stream.

With respect to claims 54, Okada discloses all claim limitations as set forth above. Okada fails to show wherein said controller includes a memory portion in which at least a lower and a higher threshold values are stored for each of the sulfur-absorbent beds containing the sulfur-absorbent material, and wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the sulfur-absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device. Edlund teaches a fuel processing system wherein the controller includes a memory portion (fig. 2, 56) in which at least a lower and a higher threshold values are stored for each of the absorbent beds containing the impurities absorbent material, and wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is

adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device in order to alert users that there has been a failure (col. 4, lines 31-33 and lines 36-46) and (col. 6, lines 52-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a controller which includes a memory portion in which at least a lower and a higher threshold values are stored for each of the absorbent beds containing the impurities absorbent material, and wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the lower threshold value, the controller is adapted to send a first control signal to a user-notifying device, and further wherein upon determination that one of the beds containing the impurities absorbent material is operating at a capacity that exceeds the higher threshold value, the controller is adapted to send a second control signal to the user-notifying device in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

With respect to claim 55, Okada discloses all claim limitations as set forth above. Okada fails to show wherein the user-notifying device is adapted to produce different responses responsive to receiving the first and the second control signals. Edlund teaches a fuel processing system (fig. 2) wherein the user-notifying device is adapted to produce different responses responsive to receiving the first and the

second control signals in order to alert users that there has been a failure (col. 6, lines 53-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include user-notifying device is adapted to produce different responses responsive to receiving the first and the second control signals in Okada's reformer, as taught by Edlund, in order to alert users that there has been a failure.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Towler is cited to demonstrate the state of the art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaity Handal whose telephone number is (571) 272-8520. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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KH

8/5/05

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